Federal Energy Management Program

FEMP Designated Product:
Electric Water Heaters

Leading by example, saving energy and taxpayer dollars in federal facilities

Purchasing Specifications for Energy-Efficient Products

Legal Authorities

Federal agencies are required by the Energy Policy Act of 2005 (P.L. 109-58) and Federal Acquisition Regulations (FAR) Subpart 23.2 to specify and buy ENERGY STAR®-qualified products or, in categories with no ENERGY STAR label, FEMP-designated products which are among the highest 25 percent of equivalent products for energy efficiency.

Performance Requirement for Federal Purchases

Storage Tank Volume	Energy Factor[a]	Annual Energy Use[b]
Less than 60 gallons	0.93 or higher	4,721 kWh/year or less
60 gallons or more	0.91 or higher	4,825 kWh/year or less

a) Energy Factor is an efficiency ratio of the energy supplied in heated water divided by the energy input to the water heater.

b) Based on DOE test procedure (10 CFR 430, Sub-Part B, Appendix E).

Buying Energy-Efficient Electric Water Heaters

This purchasing specification applies to residential, electric, storage-type water heaters with capacities between 20 and 120 gallons and maximum energy input of 12 kilowatts. When purchasing electric water heaters directly from commercial sources, check the yellow EnergyGuide labels for models with Annual Energy Use (kWh/year) at or below the level shown in the *Performance Requirement* table. In contracts and solicitations specify that electric water heaters meet or exceed the energy factor (EF) shown above.

Agencies must use ENERGY STAR-qualified and FEMP-designated performance requirements for all procurements of energy-consuming products and systems including guide and project specifications, and construction, renovation and service contracts. They should also be used in evaluating responses to solicitations. In contracts and solicitations, agencies must specify that electric water heaters meet or exceed the energy factors shown in the *Performance Requirement* table.

The federal supply sources for electric water heaters are the General Services Administration (GSA) and the Defense Logistics Agency (DLA). GSA sells water heaters through its Multiple Awards Schedule program and online shopping network, *GSA Advantage!* DLA offers them through the Defense Supply Center Philadelphia and online through DoD *EMall*. GSA and DLA typically include EF in the product data they list for water heaters. When buying from GSA or DLA, look for water heaters that meet or exceed the EF requirement of this *Specification*.

If neither EF nor annual energy use data is available, check the water heater's make and model number against the products listed in the *GAMA Directory* (see *For More Information*). This online resource contains EF and other performance data for most of the electric water heaters sold in the US.

Buyer Tips

Storage tank water heaters are the most commonly used products, but also the least efficient. Because they keep tanks full of water heated at all times and are typically located away from the points of use, water heaters have high standby losses. Where hot water use is low (i.e., rest rooms in office buildings) installing a tankless (also called demand-type or instantaneous) electric water heater can result in substantial savings. These products heat water as it is needed and, due to their compact size, are typically located near the point of use. Absence of a storage tank and shorter distribution lines greatly reduce standby losses and increase efficiency.

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Depending on the climate and energy costs, a solar-assisted or heat pump water heater may also result in substantial energy and cost savings.

Water heaters must be sized properly. Over-sized water heaters not only cost more to buy but use more energy due to excessive cycling and higher standby losses. ACEEE's *Consumer Guide* and GAMA *Consumer Directory* (see *For More Information*) provide guidance on proper sizing. A water heater should be selected based on first-hour rating (FHR), not tank size. When installing storage tank water heaters, select the smallest model that meet the FHR and this *Specification*.

User Tips

Energy costs increase with water temperature. Dishwashers require the hottest water of all household uses, typically 135 to 140º F. However, these devices are usually equipped with booster heaters to raise the incoming water temperature by 15 to 20º F. Setting the water heater between 120 and 125º F and turning the dishwasher's booster on should provide sufficiently hot water while saving energy and reducing the chances for scalding. Turning electric water heaters down or off during unoccupied periods will also save on energy costs, as will water heater timers or load controls in buildings with time-of-use rates or demand charges.

Cost-Effectiveness Example

Performance	Base Model[a]	Required	Best Available[b]
Energy Factor (EF)	0.90	0.93	0.95
Annual Energy Use (kWh/year)	4,879	4,721	4,622
Annual Energy Cost	$293	$283	$277
Lifetime Energy Cost[c]	$2,820	$2,720	$2,670
Lifetime Energy Cost Savings	–	$100	$150

a) The efficiency (EF) of the Base Model is the minimum allowed by current US DOE appliance standards.

b) More efficient products may have been introduced to the market since this specification was published. Performance data for the best available model was obtained from the November 2005 GAMA Directory (see *For More Information*).

c) Lifetime Energy Cost is the sum of the discounted value of annual energy costs based on average usage and an assumed water heater life of 13 years. Future electricity price trends and a discount rate of 3.0% are based on federal guidelines (effective from April, 2005 to March, 2006).

Cost-Effectiveness Assumptions

In the table above, the *Base Model* is a 50 gallon storage-type water heater with an EF of 0.90 and FHR of 62 gallons, the *Required* water heater is a 50 gallon storage-type with an EF of 0.93 and FHR of 60 gallons, and the *Best Available* is a 50 gallon storage-type with an EF of 0.95 and FHR of 58 gallons. Annual energy use in this example is based on the standard DOE test procedure and calculated assuming an inlet water temperature of 58º F, a setpoint of 135º F, daily hot water demand of 64 gallons, and 365 days per year of use. The assumed electricity price is 6¢ per kilowatt-hour (kWh), the average at federal facilities in the US.

Using the Cost-Effectiveness Example

In the example above, the *Required* water heater is cost-effective if its purchase price is no more than $100 above the *Base Model*. The *Best Available* model is cost-effective if its purchase price is no more than $150 above the *Base Model*.

What if my Energy Price is different?

FEMP provides a Web-based cost calculator for water heaters. Go to http://www.eere.energy.gov/femp/technologies/eep_waterheaters_calc.cfm and input the rate for electricity at your facility. The output section will automatically display results that better reflect your energy costs.

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For More Information:

EERE Information Center
1-877-EERE-INF or 1-877-337-3463
www.eere.energy.gov/femp/procurement/

General Services Administration
(816) 926-6760
www.fss.gsa.gov/
www.gsaadvantage.gov/

Defense Logistics Agency
www.dla.mil/
www.emall.dla.mil/

Defense Supply Center Philadelphia
Phone: (800) DLA-BULB or (215) 737-7950
www.dscp.dla.mil/

American Council for and Energy Efficient Economy (ACEEE) publishes the *Consumer's Guide to Home Energy Savings* which contains a chapter on water heating and list of energy-efficient products. This guide is available from ACEEE at:
(202) 429-0063
www.aceee.org/

Gas Appliances Manufacturers Association (GAMA) publishes the *Consumer's Directory of Certified Efficiency Ratings for Heating and Water Heating Equipment*. This directory is available from GAMA at:
(703) 525-9565
www.gamanet.org/

Lawrence Berkeley National Laboratory provided market research and life cycle cost analysis in support of this energy-efficiency purchasing specification.
(202) 646-7950

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

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